

REMARKS

In this Amendment, Applicants amend claims 8 and 12 to more appropriately define the present invention. Upon entry of this Amendment, claims 8 – 19 remain pending, with claims 16 – 19 withdrawn from consideration as drawn to a nonelected invention, and claims 8 – 15 under current examination.

Regarding the Final Office Action:

In the Final Office Action, the Examiner required correction to the specification to conform with a previous drawing correction, and maintained the rejection of claims 8 – 15 under 35 U.S.C. § 103(a) as being unpatentable over “Applicants’ admitted prior art” (“AAPA”) in combination with Hisamune (U.S. Patent No. 6,414,352B2) and Takeuchi (U.S. Patent No. 5,907,183).

Applicants respectfully traverse the rejection, as detailed above, for the following reasons.

Regarding the Amendments to the Specification:

In the Amendment of February 18, 2004, Applicants amended the drawings to change the figure number label of Figs. 17 and 18, changing the figure number label of Fig. 18 to “Fig. 17,” and vice versa. In the Final Office Action, the Examiner required that Applicants amend the specification at page 19 to reflect the change to Figs. 17 and 18.

In response, Applicants have amended the specification as indicated in the “Amendments to the Specification” section above, such that Fig. 17 is described as “FIG. 17 is a microscopic photograph of a semiconductor structure containing a silicon nitride film oxidized by the oxidizing method according to the present invention...,” and Fig. 18 is described as “FIG. 18 is a microscopic photograph of a semiconductor structure containing a silicon nitride film oxidized

by the conventional oxidizing method,” which is consistent with the labeling in Replacement Drawing Sheets filed on February 18, 2004.

Applicants submit that these amendments contain no new matter, and respectfully request the Examiner withdraw the objection.

Regarding the Amendments to Claims 8 and 12:

Applicants amend claims 8 and 12 to more appropriately define the invention. In particular, amended claims 8 and 12 both recite, *inter alia*, “lowering a surface of the semiconductor substrate under a part of the insulating film relative to a surface of the semiconductor substrate under the film which is processed to cause the portion of the insulating film to be exposed to the outside by applying a thermal oxidation process to a semiconductor structure.” Support for the amendment may be found, for example, on page 13, lines 5 – 12 of the specification.

Therefore, the amendments to the claims contain no new matter, and comply with the requirements of 37 C.F.R. § 1.121(f). In addition, Applicants respectfully remind the Examiner that “[a]mendments to an application which are supported in the original description are NOT new matter.” M.P.E.P. § 2163.07, emphasis in original.

Applicants submit that these amendments should render the application in condition for allowance after consideration of the remarks that follow, and should not place any burden on the Examiner insofar as raising new issues or requiring further searches of the art to reconsider these claims, as amended.

Regarding the Rejection of Claims 8 – 15 under 35 U.S.C. § 103(a):

Applicants respectfully traverse the rejection of claims 8 – 15 under 35 U.S.C. § 103(a) as being unpatentable over AAPA in combination with Hisamune and Takeuchi. Applicants

respectfully disagree with the Examiner's arguments and conclusions, and respectfully submit that a *prima facie* case of obviousness has not been established.

In order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art reference (or references when combined) must teach or suggest all the claim elements. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. Third, there must be a reasonable expectation of success. *See* M.P.E.P. § 2143.

The Examiner has not shown that all the elements of Applicants' claims are met in the cited references, has not shown that there is any suggestion or motivation to modify the cited references to result in the claimed invention, and has not shown there would be any reasonable expectation of success from so doing.

Prior Art Reference(s) Must Teach or Suggest All the Claim Elements

Applicants respectfully point out that the first requirement for establishing a *prima facie* case of obviousness has not been established: namely, AAPA, whether taken alone or in combination with Hisamune and Takeuchi, does not teach or suggest each and every element of Applicants' claimed invention. This is evidenced, not only by the Examiner's admission of the deficiencies pointed out in AAPA (Final Office Action, p. 5 "The applicants' admitted prior art does not provide, in the oxidation step, oxidizing gas containing one of ozone and oxygen radicals"), but also from the arguments that follow.

To begin, Applicants' independent claims 8 and 12, as amended, recite, among other things,

“generating an oxidizing gas containing one of ozone and oxygen radicals, the oxygen radicals being generated by converting an oxygen containing gas into plasma state or by reacting a first gas containing oxygen and a second gas containing hydrogen; and

lowering a surface of the semiconductor substrate under a part of the insulating film relative to a surface of the semiconductor substrate under the film which is processed to cause the portion of the insulating film to be exposed to the outside by applying a thermal oxidation process to a semiconductor structure obtained owing to the steps of an oxidation process using the oxidizing gas containing one of ozone and oxygen radicals.”

For the reasons already of record, and supplemented as follows, Applicants submit that Hisamune does not teach or suggest at least these elements of Applicants’ independent claims 8 and 12. Therefore, Hisamune’s method does not provide for

“generating an oxidizing gas containing one of ozone and oxygen radicals, the oxygen radicals being generated by converting an oxygen containing gas into plasma state or by reacting a first gas containing oxygen and a second gas containing hydrogen.”

In addition, Applicants submit that Hisamune does not provide for Applicants’ claimed

“lowering a surface of the semiconductor substrate under a part of the insulating film relative to a surface of the semiconductor substrate under the film which is processed to cause the portion of the insulating film to be exposed to the outside by applying thermal oxidation process to a semiconductor structure obtained owing to the steps of an oxidation process using the oxidizing gas containing one of ozone and oxygen radicals” (Applicants’ independent claims 8 and 12).

Moreover, AAPA, on pp. 6 – 7 of the specification, points out problems with the conventional oxidation processes, and therefore does not provide for Applicants' claimed

“lowering a surface of the semiconductor substrate under a part of the insulating film relative to a surface of the semiconductor substrate under the film which is processed to cause the portion of the insulating film to be exposed to the outside by applying thermal oxidation process to a semiconductor structure obtained owing to the steps of an oxidation process using the oxidizing gas containing one of ozone and oxygen radicals” (Applicants' independent claims 8 and 12).

Furthermore, the Examiner included Takeuchi to disclose “ten conventional examples for Si-N bonds...” (Office Action, p. 3). Takeuchi's stacked films (*See* Takeuchi, Abstract, generally) do not serve to cure the deficiencies of AAPA and/or Hisamune when applied to Applicants' independent claims 8 and 12, discussed above, since Takeuchi's silicon oxide film (col. 5, for example) or tunnel oxide film (col. 6, for example), does not provide for Applicants' claimed

“lowering a surface of the semiconductor substrate under a part of the insulating film relative to a surface of the semiconductor substrate under the film which is processed to cause the portion of the insulating film to be exposed to the outside by applying thermal oxidation process to a semiconductor structure obtained owing to the steps of an oxidation process using the oxidizing gas containing one of ozone and oxygen radicals” (Applicants' independent claims 8 and 12).

Applicants therefore submit that AAPA in combination with Hisamune and/or Takeuchi fails to teach or suggest all the elements of Applicants' independent claims 8 and 12.

Therefore, the Examiner's application of AAPA, Hisamune, and Takeuchi as references does not satisfy the tenets of a proper 35 U.S.C. § 103(a) rejection, and the Examiner has not met an essential criteria for establishing a *prima facie* case of obviousness, wherein "the prior art reference (or references when combined) must teach or suggest all the claim limitations." See M.P.E.P. §§ 2142, 2143, and 2143.03.

Lack of Suggestion or Motivation to Modify or Combine Reference Teachings for Prima Facie Obviousness

M.P.E.P. § 2141 sets forth some "Basic Considerations which Apply to Obviousness Rejections," as follows:

"When applying 35 U.S.C. 103, the following tenets of patent law must be adhered to:

- (A) The claimed invention must be considered as a whole;
- (B) *The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;*
- (C) *The references must be viewed without the benefit of impermissible hindsight vision* afforded by the claimed invention; and
- (D) *Reasonable expectation of success is the standard* with which obviousness is determined.

Applicants have already established that the cited references do not teach or suggest all the elements of Applicants' independent claims 8 and 12, and therefore now supplement those arguments to further demonstrate lack of obviousness as follows. The Examiner alleged that the combination of AAPA, Hisamune, and Takeuchi "would have been obvious to one of ordinary skill in the art at the time the invention was made to apply further the steps of Takeuchi into the above combination of Hisamune with applicants' admitted prior art process" (Final Office Action, p. 6), yet provides no reasoning or basis to support this allegation.

The M.P.E.P. sets forth:

“Obviousness can only be established by combining or modifying the teaching of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art.” “[I]t is necessary to ascertain whether or not the reference teaching would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification.” M.P.E.P. § 2143.01, emphasis added.

Applicants submit that one skilled in the art could only arrive at the present claimed invention by consulting Applicants’ disclosure, yet “[t]he teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on [A]pplicant’s disclosure.” M.P.E.P. § 2142, internal citations omitted. Accordingly, the teachings of Hisamune and Takeuchi, taken alone or in combination, still do not provide the requisite motivation to one of ordinary skill in the art to facilitate their combination with AAPA, *from within the references themselves*, implicitly or otherwise. Applicants also note that one of ordinary skill in the art must have this motivation or reason *without the benefit of Applicants’ specification* to modify the references.

Applicants therefore submit that one of ordinary skill in the art would not have been motivated to combine AAPA with Hisamune or Takeuchi, as there is nothing in particular to gain from such a combination, as what is obtained still does not lead one of ordinary skill in the art at the time the invention was made to achieve the present claimed invention. As noted above, even if combinable in the manner proposed by the Examiner, the resulting combination of references would fail to teach or suggest each element of Applicants’ independent claims 8 and 12.

Applicants therefore respectfully remind the Examiner that “[t]he initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor has done.” M.P.E.P. § 2142. The prior art references themselves must provide the motivation to combine, and the presently applied references clearly fail to do so, therefore failing to provide some suggestion of the desirability of doing what Applicants have done.

As already demonstrated, the combination of these references as applied by the Examiner *a priori* fails to establish obviousness of the claimed invention. Furthermore, Applicants have pointed out deficiencies in the cited prior art that render nugatory any indication that the cited references would give any motivation or reason to one of ordinary skill in the art to modify them *without the benefits of Applicants’ specification*.

Therefore, even the Examiner’s application of AAPA, Hisamune, and Takeuchi still does not establish that there would have been the requisite suggestion or motivation to modify either or all of them. “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” M.P.E.P. § 2143.01, p. 2100-126, citing *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990) (emphasis in original).

In light of the above-described shortcomings of AAPA, Hisamune, and Takeuchi, Applicants respectfully submit that the Examiner points to no evidence supporting the notion that one of ordinary skill in the art, having these references before him/her, would have been motivated to modify them to produce Applicants’ present claimed invention. Also, for at least these reasons, the Examiner fails to meet the burden for establishing a *prima facie* case of obviousness.

Lack of Reasonable Expectation of Success for Prima Facie Obviousness

As evidenced from previous arguments regarding the cited references, Applicants submit that there would be no reasonable expectation of success to be derived from modifying or combining the cited references, as this would diverge from the present invention, as claimed in Applicants' independent claims 8 and 12. Accordingly, the Examiner's reliance on the cited references is not sufficient to establish *prima facie* obviousness.

Since Applicants have already demonstrated the deficiencies in the cited references and that they do not provide any suggestion or motivation to produce the present claimed invention, there can be no reasonable expectation of success expected by one of ordinary skill in the art when combining them.

Moreover, Applicants respectfully disagree with Examiner's allegation that "[t]he critical concentration of $5 \times 10^{13} \text{ cm}^{-2}$ nitrogen in the interface of silicon oxynitride film with the silicon substrate would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization..." (Final Office Action, p. 6), despite the fact that the cited references, taken singly or in combination, fails to teach or suggest at least the previously quoted elements of Applicants' independent claims 8 and 12. Applicants respectfully direct the Examiner's attention to M.P.E.P. § 2144.05(II)(A) and (B), which sets forth some guidelines for "Optimization of Ranges" "through routine experimentation" vis-à-vis a discussion of *In re Aller*, 105 USPQ 233, 255 (CCPA 1955). In light of these guidelines and the discussion that follows, Applicants respectfully point out that the holding of *In re Aller* does not apply here.

Citing *In re Aller*, the M.P.E.P. states: "Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art

unless there is evidence indicating such concentration or temperature is critical.” In *In re Aller*, the court presumed that changes in concentration and temperature in an organic synthesis context can be optimized without undue experimentation. This is a rebuttable presumption, and was applied in *In re Aller* only to concentration and temperature ranges in the organic chemistry arts in which *In re Aller* was related. The Examiner has not cited any evidence, however, to show that any such presumption exists in the electrical, semiconductor, or materials arts regarding the elements of Applicants’ independent claims 8 and 12, and the doping concentration recited in dependent claims 11 and 15. Applicants therefore respectfully submit that the *In re Aller* presumption, discussed in M.P.E.P. § 2144.05(II)(A) and (B) does not apply to the present situation.

Moreover, even if *In re Aller* did apply (which it does not), the court has recognized two exceptions subsequently in *In re Antonie*, 559 F.2d 618 (CCPA 1977). See also M.P.E.P. § 2144.05(II)(B). The M.P.E.P. clearly states the first exception, citing *In re Antonie*: “A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*” (internal citations omitted).

Here, the Examiner has not met his burden of showing that the previously quoted elements of Applicants’ independent claims 8 and 12 were recognized by those of ordinary skill in the art as result-effective variables.

Furthermore, the second exception is discussed in the last paragraph of *In re Antonie*: “In *In re Aller*, the court set out the rule that the discovery of an optimum value of a variable in a known process is normally obvious. We have found exceptions to this rule in cases where the

results of optimizing a variable, which was known to be result effective, were unexpectedly good. *In re Wymouth*, 449 F.2d 1273 (CCPA 1974).” Id.

Applicants respectfully disagree with the Examiner’s unsupported assertion that “[such modification] would have been an obvious matter of design choice [and] ascertainable by routine experimentation and optimization” (Final Office Action, p. 6). A detailed study of features related to Applicants’ present invention clearly shows that this is not the case. No one of ordinary skill in the art could have developed Applicants’ claimed elements on the basis of the cited references. Accordingly, Applicants respectfully submit that, for at least the foregoing reasons, the rejection is improper and should be withdrawn.

In summary, the Examiner has not met the criteria for establishing a *prima facie* case of obviousness. Namely, Applicants have demonstrated above that the Examiner: (a) has not shown that all recitations of Applicants’ claimed invention are taught or suggested by AAPA, Hisamune, and Takeuchi; (b) has not shown any requisite suggestion or motivation to modify AAPA, Hisamune, and Takeuchi to produce Applicants’ claimed invention; and (c) has not shown there would be any reasonable expectation of success from modifying AAPA, Hisamune, and Takeuchi in order to produce the present claimed invention. Applicants’ independent claims 8 and 12 therefore are allowable over the Examiner’s proposed combination of references.

Regarding dependent claims 9 – 11 and 13 – 15:

Finally, Applicants note that the M.P.E.P. sets forth that “[i]f an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.” M.P.E.P. § 2143.03. Therefore, Applicants submit that independent claims 8 and 12 are allowable, for the reasons argued above. In addition, dependent claims 9 – 11 and 13 – 15 are also allowable at least by virtue of their respective dependence from allowable base claims 8 and

12. Therefore, Applicants respectfully submit that the Examiner should withdraw the 35 U.S.C. § 103(a) rejection.

Additional Comments:

Applicants now respond individually to additional assertions set forth in the Final Office Action.

Regarding Item 4 of the Final Office Action:

The Examiner apparently recognizes “that obviousness can only be established by combining or modifying ... where there is some teaching, suggestion, or motivation to do so...” (Final Office Action, p. 3). The Examiner then makes a generalized allegation that Applicants’ AAPA “lacks oxidizing gas containing one of ozone and oxygen radicals; the Hisamune [reference] serves to cure the deficiency of applicant’s admitted prior art” (Final Office Action, p. 3). Applicants submit that this blanket generalization fails to provide the requisite motivation required to establish *prima facie* obviousness, for the reasons presented in the previous section. As such, Applicants respectfully disagree with the Examiner’s allegation, since it is without support or any substantial evidence of record.

Regarding Item 5 of the Final Office Action:

The Examiner responded to Applicants’ arguments that the Examiner used improper hindsight by paraphrasing a statement about hindsight from *In re McLaughlin*. See Final Office Action, pp. 3 – 4). Applicants respectfully submit, however, that the case cite to *In re McLaughlin* alone is insufficient to establish that the combination of applied references is based on impermissible hindsight.

Regarding Item 6 of the Final Office Action:

The Examiner alleged that “the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious” (Final Office Action, p. 4, internal citations omitted). Applicants submit that the Examiner has not provided any arguments or reasoning to support this allegation that “the differences would otherwise be obvious.” The Examiner’s assertions fail to establish the references, considered as a whole, suggest the desirability and thus the obviousness of making the combination, or that the advantages identified by Applicants would “flow naturally from ... the prior art” (Final Office Action, p. 4).

Regarding Item 7 of the Final Office Action:

The Examiner alleged that “one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references” (Final Office Action, p. 4, internal citations omitted). Applicants submit, however, that they have not attacked references individually. Rather, Applicants have conclusively shown that the references, taken singly *or in combination*, fail to teach or suggest all the elements of Applicants’ independent claims 8 and 12. Specifically, Applicants have demonstrated that there is a lack of suggestion or motivation to modify or combine reference teachings for *prima facie* obviousness, and a lack of reasonable expectation of success for *prima facie* obviousness, when the references are considered alone or in combination.

Regarding Item 8 of the Final Office Action:

Applicants submit that independent claims 8 and 12, portions of which are quoted herein, are method claims, e.g. “A method of manufacturing a semiconductor device comprising the steps of:” (independent claims 8 and 12), and therefore Applicants are not required to have “a recitation of the intended use of the claimed invention [that] must result in a structural difference

between the claimed invention and the prior art” (Final Office Action, p. 4, internal citations omitted). As such, Applicants submit that the Examiner is improperly applying case law in an attempt refute Applicants’ arguments that there is no reasonable expectation of success. In a rejection, the Examiner may use the rationale of legal precedent established by prior case law, subject to the following considerations. “The examiner must apply the law consistently to each application after considering all the relevant facts. *If the facts in a prior legal decision are sufficiently similar to those in an application under examination*, the examiner may use the rationale used by the court.” M.P.E.P. § 2144 (emphasis added). Applicants submit that the record shows the Examiner is improperly using citations to *In re Casey* and *In re Otto* to effect generalized observations about “process of making” claims, without regard for the specific fact of the prior legal decisions.

Conclusion:

In view of the foregoing, Applicants request the Examiner’s reconsideration of the application and submit that the rejection detailed above should be withdrawn. This Amendment should allow for immediate and favorable action by the Examiner. Applicants submit that pending claims 8 – 15 are in condition for allowance, and request a favorable action.

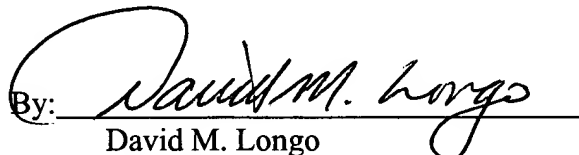
Should the Examiner continue to dispute the patentability of the claims after consideration of this Amendment, Applicants encourage the Examiner to contact Applicants’ undersigned representative by telephone to discuss any remaining issues or to resolve any misunderstandings. Applicants’ undersigned representative would welcome the opportunity to discuss the merits of the present invention with the Examiner if telephone communication will aid in advancing prosecution of the present application.

Please grant any extensions of time under 37 C.F.R. § 1.136 required in entering this response. If there are any fees due under 37 C.F.R. § 1.16 or 1.17, including any fees required for an extension of time under 37 C.F.R. § 1.136, please charge such fees to our deposit account 06-0916.

Respectfully submitted,

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